ODS specialist in Samplers & Analytical Systems

Online TC, TOC, TN, COD, TOD-analyser model Quickultra

The online Quick**ultra**, manufactured by LAR Process Analysers AG, is a multi functional TC, TOC, COD, TN analyser. This analyser is designed and suitable for use in an industrial area. Common applications are the monitoring of process water, waste water, cooling water, influent and effluent streams. The Quick**ultra** uses a patented injection system. A precise volume of waste water is injected into the thermal oxidation reactor. At a temperature of 1200ºC all species e.g. inorganic carbons, organic carbons and organic nitrogen components are fully oxidised (100% recovery). No catalyst is used.

The Quick**ultra** is available as a:
Total Carbon Analyser (TC-analyser)
Total Organic Carbon analyser via the direct method (TOC-direct)
Total Organic Carbon analyser via the differential method (TOC-differential).
Total Nitrogen analyser (TN)
Total Oxygen Demand analyser (TOD); synonym with fast Chemical Oxygen Demand (COD-o)
In principle any combination of above mentioned analysis methods is available!
TC/TOC, TN and TOD are measured simultaneously meaning that the measurement results are directly available after one analysis cycle, typically 3 to 5,5 minutes.

The Quick**ultra** operates via a fully programmable robot that controls the functions and positions of the robust injection needle. Only a few parts are in contact with the waste water: sample inlet tube, sample overflow vessel, sample outlet tube and an optional sample pump. After every waste water injection, the injection needle is flushed with rinse water. This all results in a minimum of maintenance.

The injection volume is fully programmable from 10 to 600 micro litre making the analyser very suitable for many applications from 0,1 to 50.000 mg/litre carbon and up to 150.000 mg/litre oxygen demand. No sample dilution technique is needed. For relatively clean water, such as cooling water and effluent water, a high sample volume is injected or/and a more sensitive CO_2-sensor is used. For highly polluted water, such as process water and influent water, a low sample volume is injected and/or a less sensitive NDIR sensor is used.

The peak area calculation method that is used, results in an excellent repeatability and long term stability. Furthermore, the advantage of using the 1200ºC thermal oxidation technique is:
- no memory effects,
- a rapid response to big concentration changes
- A fast analysis cycle time
- carry over effects (cross contamination) are very low, meaning that this analyser is very suitable for multi-stream and multi range applications.

ODS delivered many Quick-analysers to all kinds of industries. We have experience with e.g. influent waste water of a pulp & paper mill, waste water of a milk powder factory, oil in water of a refinery, spill detection of petrochemical industries, waste water with waxes, brackish salty cooling water, discharge load monitoring and influent/effluent control of a WWTP.
This Quick**ultra**TC/TOC/COD/TOD/TN analyser measures quickly and accurately.

The XY-robot, in combination with the free programmable multi task software, offers unique flexibility. Furthermore the hardware is designed and pre-constructed in such a way that it is easy to change an analyser functionality or measuring principle.

Examples of standard functionality:
- Flush the sample system during service or set-up
- Measure a single point of a standard or a grab sample. Evaluate the repeatability and mark outliers.
- Automatically analyse samples, flush the sample system with water, flush the rest of the water to drain.
- Perform a calibration routine manually or automatically

Quick **U**nlimited
Low Maintenance
True TOC
Reliable
Accurate

Proven technology: XY-robot and 1 to 6 sample vessels

Injection system, injection needle and injection port

100% recovery with thermal oxidation at 1200ºC

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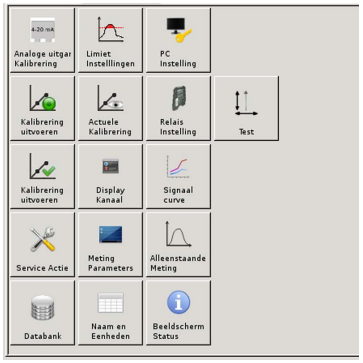
True TOC

The Quick**ultra** is capable of handling waste water with a high load of suspended organic particles. Not only can it easily process these samples, it also completely oxidises all organics, dissolved and organic particles. The advanced robot driven injection technique, in combination with a non catalytic 1200ºC thermal oxidation, make this possible.
The QuickTOC**ultra** measures the sum of dissolved organic carbons, particulate organic carbons and purgeable organic carbons.

Features of the Quick**ultra**

- Large touch screen.
- Intuitive software design. Customisable configuration based on prepositional icons
- Three user levels, pass word protected
- The thermal oxidation technique at 1200ºC guarantees complete oxidation (100% recovery).
- Also organic particles (particulate organic carbon) will be oxidised completely.
- At 1200ºC memory effects are minimum resulting in a fast analyser response.
- Fast analysis time of 3 minutes (TC) and 5,5 minutes (TOC)
- Very stable analysing results due to the batch injection technique, auto zero technique and peak area calculation. Zero drift = 0 mg/litre C. per year.
- Programmable injection volume offers flexibility in optimising and setting the analyser range.
- Low salt built-up in the reactor due to the low volume injection method & 1200 degree oxidation.
- Free programmable robot technique offers configuration flexibility such as very low carry over effects making the analyser suitable for 2-stream analysis, multi-stream and multi range applications.
- Multi-stream feature support up to 6 streams.
- Low maintenance because of a patented flush system that cleans the injection system (needle) after every sample injection.
- Sample inlet filtration or conditioning is normally not needed.
- Low consumption of a concentrated acid solution (only TOC-analyser uses acid)
- Easy manual or automatic/daily calibration and easy validation due to internal robot selectable calibration vessel.
- Easy analyser inspection due to self diagnostic software and extra diagnostic sensors such as carrier gas inlet & outlet flow measurement, relative humidity sensor (option), circuit pressure measurement.
- Data presentation and data storage. internal memory and data logger. USB and RS-232 interface.
- Cabinet with a separate dry compartment for all electrical parts and a wet compartment for all analyses parts. Easy access for analyser maintenance.
- Optional TCP/IP and/or RS232 communication

De Quick**ultra** ATEX Zone 2/1 Ex p cabinet with air-air cooler



Touch screen with pictograms, multi language (example: Dutch)

Sample pre treatment e.g. filtration is not needed (TRUE-TOC)

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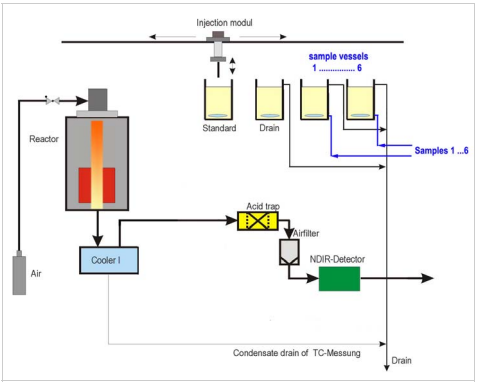
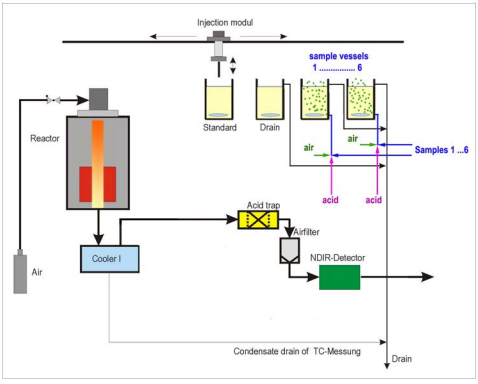
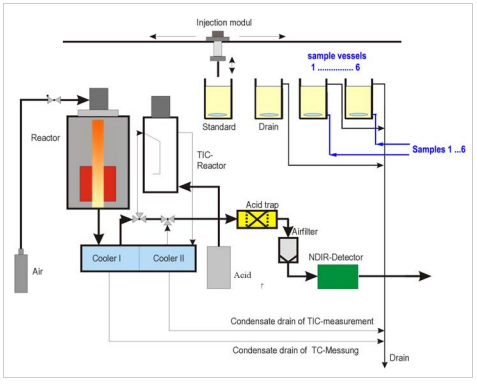
TC, TOC, TIC ANALYSIS METHODS



Block diagram of the TC-method



Block diagram of the TOC-direct method



Block diagram of the TOC-differential method

Total Carbon:

Dry and CO_2-free carrier gas flows through the high temperature reaction tube (1200°C). Then the carrier gas flows through a gas/sample cooler and a gas scrubber The dry and clean carrier gas then flows through the NDIR CO_2-analyser. Prior to injection the NDIR measures the base line zero value.

The robot controls the needle position and sample suction syringe. The needle is positioned into the sample overflow cup and is filled precisely with a programmed fresh sample volume.

Then the robot positions the needle into the injection inlet port. A needle sensor detects the needle and opens the inlet cock valve. Then the needle is positioned deep into the 1200ºC reactor tube and a precise volume of sample is injected.
Organic carbon and inorganic carbon is completely oxidized to CO_2 (and H_2O and NO_x etc.). No catalyst is used.

The carrier gas transports the CO_2 to the NDIR CO_2 gas analyser. Via peak area calculation the amount of CO_2 is determined. By comparing the outcome to wet calibrations, the Total Carbon concentration in the waste water is calculated.

Total Organic Carbon; direct:

The TOC-concentration is determined by pretreatment of the sample via acid, prior to injection of the sample into the thermal oxidation reaction tube.

The Carbonate Removal System:
The sample is mixed with a strong acid solution (for example 1% of HCl). The pH of the mixture is < 2,5. This acidified sample flows into a mixing vessel and during a specific period CO_2-free carrier gas bubbles through.
At a pH < 2,5 Inorganic Carbon (Carbonates) react as follows:
CO_3^{2-} (aq) + $2H^+$ (aq) = H_2O (aq) + CO_2 (g)
The carbonates, bicarbonates and free CO_2 are stripped out of the sample as CO_2-gas.

Next the sample is drawn into the injection needle and injected into the high temperature reaction tube. All exactly as with the TC-method (described left).
The outcome is presented and stored as the TOC-concentration.

The TOC-direct method is also known as the Non Purgable Organic Carbon method (NPOC). It is less suitable for samples with organics that are Purgable or volatile because they can be partially stripped out during the carbonate removal step.

Total Organic Carbon; differential:

The TOC concentration is determined via two different analysing steps.
Step 1: The Total Carbon content (TC) of the sample is analysed. (same as TC).
Step 2: Then the Total Inorganic Carbon (TIC) content is analysed
The Total Organic Carbon content is then calculated via TOC = TC-TIC

Analysing total inorganic carbon (TIC):
An extra TIC-reaction vessel is used. Via a peristaltic pump a 1% (w/w) phosphoric acid (H_3PO_4) solution is pumped into this TIC-vessel. Via an overflow the solution level is kept constant. CO_2 free carrier gas bubbles through the acid solution. Then this carrier gas leaves the TIC-vessel and flows to the NDIR gas analyser. The CO_2-baseline is measured and stored.
Now the robot positions the injection needle into the sample overflow vessel and draws an exact volume of sample. The needle is moved and positioned into the TIC-vessel and this sample is injected into the acid solution. Inorganic carbon reacts with the acid (pH < 2,5) to CO_2 gas. The stripping gas, bubbling through the TIC-vessel, then transports the CO_2 gas to the NDIR-analyser, where the CO_2-peak is measured and the TOC-concentration is calculated.
The TOC-differential method presents TC, TIC and TOC data.

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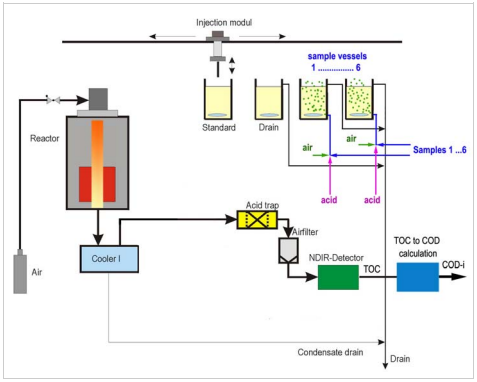
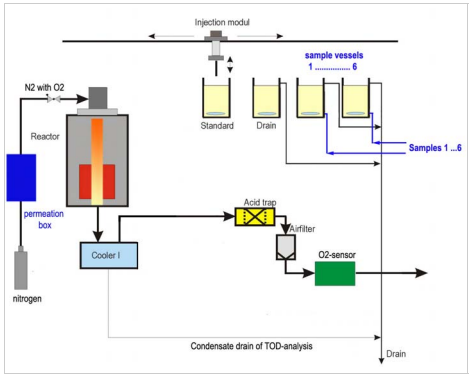
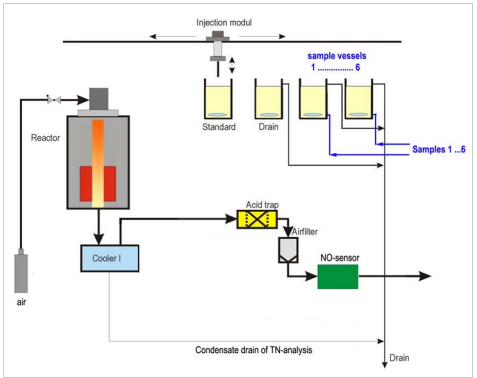
COD by correlation & COD by Total Oxygen Demand & TN ANALYSIS METHODS



Block diagram of the COD-i-method



Block diagram of the COD-o / TOD method



Block diagram of the TNb method

Chemical Oxygen Demand by COD/TOC correlation (COD-i):

The COD-i measurement takes place in only 3 minutes. The measurement method is exactly the same as the TOC-direct method, so it actually is a carbon counting method.
The conventional laboratory Chemical Oxygen Demand method determines the oxygen that is needed to oxidise organic species in waste water. This method takes about 2 hours per measurement. Harmful chemicals are consumed. As a consequence this $COD_{dichromate}$ method is not suitable for online process monitoring.
However in many cases a useful and reproducible COD/TOC correlation factor can be found. In those cases the COD value is determined by the multiplication of the measured TOC value times the COD/TOC correlation factor.

Examples of correlation factors are:

Pulp & paper mill	2,6
Milk (whole)	3,0
Cream (40%)	3,4
Whey	2,7
Saturated fatty acids	3,3— 3,8

In those cases where multiple facilities discharge waste water to the same sewer system and/or the sample composition is widely variable, a reproducible COD/TOC-correlation factor will be hard to find. In those cases we recommend the use of the TOD-method (COD-o).

Fast Chemical Oxygen Demand via the TOD method (COD-o):

A nitrogen carrier gas flows through a temperature controlled permeation box where a known constant amount of oxygen permeates the nitrogen/gas flow. This nitrogen oxygen mixture flows through the high temperature reactor (1200°C). Then the carrier gas flows through a gas/sample cooler and a gas scrubber. The dry and clean carrier gas then flows through the O_2-sensor. Prior to injection the O_2-sensor measures the O_2-value of the base line.
The robot controls the needle position and sample suction syringe. The needle is positioned into the sample overflow vessel and is filled with a precisely programmed volume of fresh sample .
Then the robot positions the needle into the injection inlet port and is positioned deep into the 1200°C reactor tube. A precise volume of sample is injected.
The sample is quantitatively oxidized. The oxygen depletion is measured, it correlates directly to the oxygen demand of the sample. The method includes the oxygen demand by non-carbonaceous compounds.

$(n1)\ (C_xH_yN_z) + (n2)\ O_2 \rightarrow (n3)\ CO_2 + (n4)\ H_2O + (n5)\ NO$ + rest

Via peak area calculation the amount of O_2-depletion is determined. By comparing the outcome to wet calibrations, the Total Oxygen Demand concentration in the waste water is calculated.

Total Nitrogen Bounded:

Dry and clean carrier gas flows through the high temperature reaction tube (1200°C) after which it flows through a gas/sample cooler and a gas scrubber. The dry and clean carrier gas then flows through the electrochemical NO sensor. Prior to injection this NO sensor measures the base line zero value.

The robot controls the needle position and sample suction syringe. The needle is positioned into the sample overflow vessel and is filled with a precisely programmed volume of fresh sample .

Then the robot positions the needle into the injection inlet port and is positioned deep into the 1200ºC reactor tube where a precise volume of sample is injected.
Nitrogen compounds e.g. organic nitrogen, ammonium, ammonium nitrogen, nitrate, nitrite, particulate nitrogen are oxidized to nitric oxide (NO).

The carrier gas transfers the NO gas to the electrochemical NO sensor. Via peak area calculation the amount of NO gas is determined. By comparing the outcome to wet calibrations, the Total Nitrogen concentration in the waste water is calculated.

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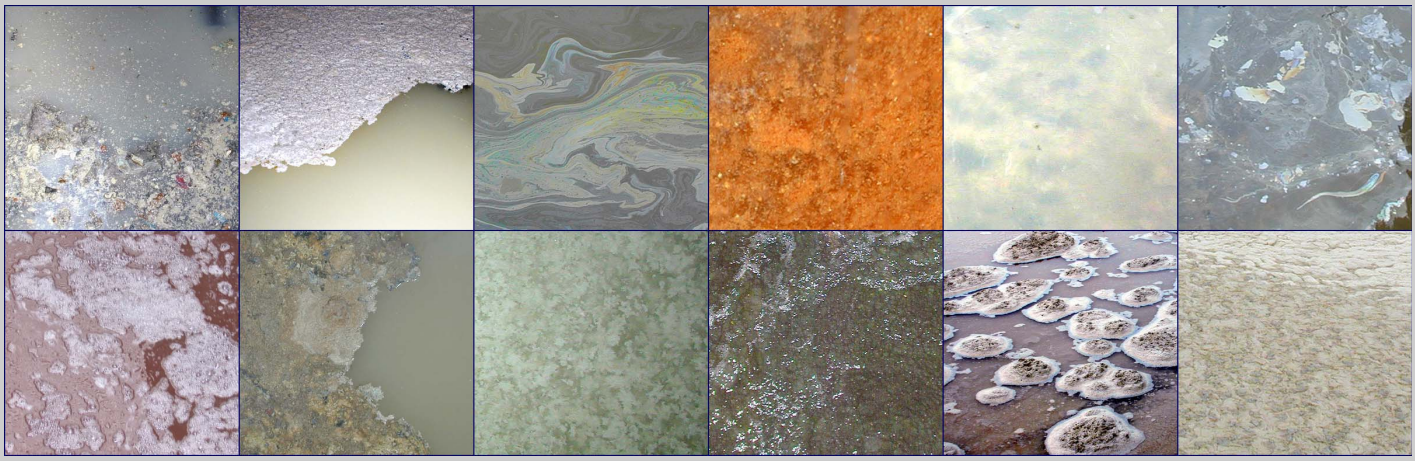
Innovative Technique based on Proven Technology

The Quick**ultra** uses the identical proven technology as used in the previous Quick-series. The parts being used e.g. XY-robot, syringe, oven, reactor, seals, glass work are identical and fully exchangeable with parts of the previous Quick-series. Its technique is based on new electronics, a different operating system and bus-communication.



Unlimited

- Lowest detectable level 0,01 mg/l C
- Highest range up to 50.000 (TOC) and 150.000 ppm (TOD) without using any sample dilution
- No use of an expensive Pt catalyst
- Suitable for a variety of waste waters
- Up to 6 sample streams
- Up to 4 gas sensors. Suitable for simultaneously analysis of TC, TOC, TIC, COD-i/TOD and TNb
- Fast response; typical cycle time 3 to 5,5 minutes
- High salt option up to 30 g/l
- Cabinets: standard, NEMA4X, NEMA4X-high-temp, ATEX Zone 2, ATEX Zone 1

Quick **U**nlimited
Low Maintenance
True TOC
Reliable
Accurate

Low maintenance

- Only a few wetted parts; sample vessel, sample tubes and injection needle.
- Low injection volume
- The injection needles is flushed with water after every sample injection
- No consumption of chemicals (TC, TN and TOD); only TOC requires an acid solution
- No use of an expensive catalyst, thermal oxidation at 1200ºC
- Fast replacement of only a few consumables on a monthly basis
- Preventative service is required once per 6 month only

True TOC

- Direct analysis of raw waste water. No sample filtration needed
- True TOC = soluble organics + purgeable organics + particulate organics
- At 1200ºC also organic particles are fully oxidized, 100% recovery
- Analysis including purgeable organic carbons and volatile organic carbons via the TOC-differential method
- Suitable for 2-stage fluids: dissolved oil and free oil, dissolved organics and organic particles

Reliable

- Proved technology even for the most demanding application
- High availability, it uses only a few wearing parts that can be replaced in minutes
- A set of sensors and smart diagnostic software monitor the correct functionality of the analyser
- High availability, suitable for process control

Accurate

- Accurate analysis results at high dynamic ranges
- Outstanding performance
- No zero drift due to the batch injection and auto zero technique
- Stable and repeatable measuring results due to peak area calculation
- Repeatable sample injection volume, full oxidation, stable and controlled carrier gas flow, stable smart gas sensors
- Auto or manual calibration and validation features

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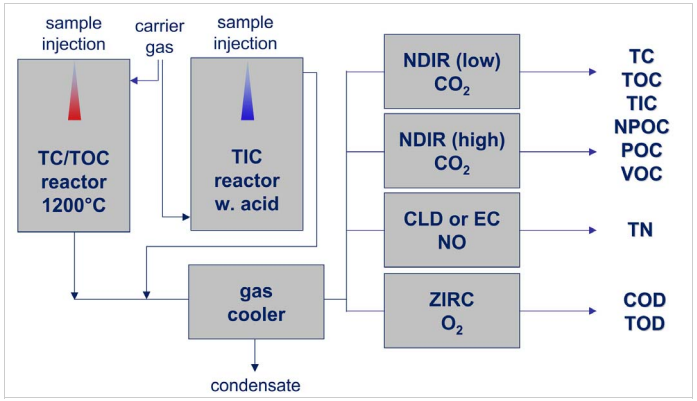
MULTI SUM-PARAMETERS:

The Quick**ultra** analyser can be equipped with 1 to 4 gas sensors. Simultaneously the following parameters are measured:

- Total Carbon (TC), Total Inorganic Carbon (TIC), Total Organic Carbon (TOC), Purgeable Organic Carbon (POC) or Volatile Organic Carbon (VOC);
- True-TOC; The sum of Dissolved Organic Carbon + Suspended Organic Carbon (SOC) + Purgeable Organic Carbons
- Total Nitrogen (TN / TNb);
- Chemical Oxygen Demand by multiplying the TOC-value with a COD/TOC-correlation factor;
- Total Oxygen Demand (TOD).



Analysis method and the types of gas sensors being used			
Measurement of the amount of carbon dioxide gas (CO_2) with a non-dispersive infrared gas sensor (NDIR)			
TC; Total Carbon (*)	Determination of the Total carbon amount.	Determination of total carbon content by Thermal combustion and analysis of the resulting CO_2	The sum-measurement of total organic carbon and total inorganic carbon (TC=TOC+TIC)
TIC; Total Inorganic Carbon (**)	Determination of inorganic carbon (carbonates en bicarbonates).	The sample is injected in a TIC-reactor. The inorganic carbon reacts with acid to CO_2-gas. A carrier gas transfers the CO_2-gas to the CO2– sensor.	The measured amount of CO_2 gas is linear proportional to the amount of inorganic carbon in water
NPOC / TOC-direct; Total Organic Carbon	Determination of Total Organic carbon. Some purgeable organic carbons can stripped out in the carbonate removal system	The sample is mixed with acid to pH < 2. Inorganic carbon reacts to carbon dioxide gas which is stripped out by use of a carrier gas	The stripped sample, containing only TOC, is injected in the 1200ºC reactor. The measured amount of CO_2 gas is linear proportional to the TOC-concentration
TOC-differential; Total Organic Carbon	Determination of Total Carbon and Total Inorganic Carbon and the calculation of Total Organic Carbon	TC is determined as described at (*) The TIC is determined as described at (**)	The TOC-concentration is calculated by difference. TOC = TC - TIC TOC included POC/VOC
POC (VOC); Purgeable Organic Carbon	Determination of Purgeable Organic Carbon (VOC) by use of a stripping technique	CO_2-free carrier gas bubbles through a vessel with sample. Purgeable organics are purged out	Determination of the purgeable organic carbons by use of thermal oxidation and the measurement of the amount of CO_2
Measurement of the amount of nitrogen oxide (NO) with an electrochemical gas sensor (ECD)			
TN / TNb; Total Nitrogen (bounded)	Determination of the total nitrogen content by thermal oxidation and the analysis of resulting nitric oxide.	The TNb content is measured via thermal oxidation at 1200ºC. TN measures the sum of organic bound nitrogen ($C_xH_yN_z$), (free) ammonia (NH_3 / NH_4^+), nitrite (NO_2^-) nitrate (NO_3^-) and nitrogen bounded particles	The measured nitric oxide amount is linear proportional to the Total Nitrogen concentration in water
Measurement of the amount of oxygen depletion (-O_2) with a zirconium oxide sensor (ZrO_2)			
COD-o; Chemical Oxygen Demand	Determination of the oxygen depletion via the Total Oxygen Demand method.	The sample is oxidised at 1200ºC. The oxygen depletion is measured in the carrier gas.	All compounds that consume oxygen due to the oxidation process are measured e.g. organic hydrocarbons, ammonia and organic bound nitrogen

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YOU NAME IT … WE BUILD IT

TC-analyser
1 stream

TOC-direct analyser
1 stream

TC, TIC & TOC-analyser differential
2 streams

TC & TN & TOD-analyser
2 streams

TOC & TN
3 streams

TC, TIC, TOC-analyser differential
6 streams

MULTI STREAM:
The Quick**ultra**-analyser is suitable for the sequential analysis of **1 to 6** sample streams.
This analysis uses a series of quartz glass vessels which are possitioned and mounted in a row. The following vessel types are used: 1 to 6 sample overflow vessels, 1 or 2 calibration vessels and a waste vessel. Its configuration depends on the specific application e.g. how many sample streams, the ranges to be analysed and the analytical method(s). These vessels are lined up with the injection port of the 1200ºC reactor and, if needed, the TIC-reactor. A robust XY-robot works in cooperation with an advanced injection system and a thick injection needle. This needle is positioned above the row of quartz glass vessels and/or reactor(s). The great advantage of the use of the XY-robot and injection system is that a minimum of wetted parts are needed. In this system no moving parts e.g. pinch valves, solenoid valves and rotating valves are used. Its an excellent system for multi stream applications, cross over contamination and carry over effects are eliminated.

MULTI INJECTION VOLUME
The Quick**ultra** offers the capability to enter program parameters per sample stream. An important parameter to enter is the sample injection volume. The great advantage is that sample streams with relative big differences in concentration levels can be measured accurately with one gas detector.
For example: The influent TOC-level of a waste water treatment plant varies from 100 to 1000 mg/l C. The effluent TOC-level of the treated waste water varies from 10 to 100 mg/l C. Influent and effluent water is measured with one QuickTOC**ultra** with only one NDIR-detector. It is configured in such a way that the injection volume of the influent measurement is 30 µl and for the effluent measurement is 300 µl. All TOC-values in the range of 10 to 1000 mg/l C are measured accurate.

MULTI RANGE:
The Quick**ultra** multi range option is very suitable for applications where an extended rangeability is needed e.g. a TOC-range from 10 to 50.000 mg C/l . To guaranty that the analyser also measures accurately at low levels, it is equipped with two gas sensors working in parallel. The NDIR gas sensor with a long gas cell measures accurate in the low TOC range, the NDIR with the short gas cell, is most suitable for precise measurements in the high range.

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LAR's Range of Online Water Quality Analysers

LAR's range of water quality analysers

Chemical Oxygen Demand analyser - model ELOX-100
- This COD method is based on Electrochemical oxidation

BOD and Respiration Analyser - Model BioMonitor
- Online fast and quick respiration measurement of the biological oxygen consumption
- Determination of the self respiration of the activated sludge

Toxicity analyser - Model Nitritox & Toxalarm
- Measurement parameters:
- BOC - Biological Oxygen Consumption with Correlation to BOD_5 laboratory method
- ASR – Activated Sludge Respiration

TC/TOC-analyser by UV-persulphate - Model Quick-TOC-UV
- Its measuring principle is based on photochemical oxidation with use of persulphate oxidising agent and OH-radicals produced by UV-light

TC/TOC/TIC/VOC pure water analysers
- Single and multi-stream analysers for return condensate and boiler feed water applications

TC/TOC/TN/TP/COD-i; model QuickTOCNPO
- Total Organic Carbon and Total Nitrogen by thermal oxidation at 1200°C, multi loop injection and simultaneous analysis of TOC/TN
- Total Phosphorous
  Measuring principle: molybdenum blue method Oxidation by UV+persulphate to PO43- According to DIN ISO 6878

Projects

ODS has the know-how and experience to offer complete customized analyser projects. We offer turn key projects:

Materials:
- A walk-in shelter
- Analysers TC, TOC, TOD, COD, OIW (oil in water) etc,
- Power distribution; power sockets, lighting
- Junction boxes; signal distribution
- Fluid piping e.g. a drain header
- HVAC; coolers, heater, dehumidifier
- Utilities such as instrument air piping, a zero air supply or nitrogen generator
- Extras such as a reagent cabinet, arctic boxes
- Waste water pumps
- Fast sample loop
- Samplers e.g. anti-isokinetic sampler
- Spare part kits

Services:
- Application research, sample tests
- Recommendation reports
- Engineering
- Documentation package, drawings and manuals, FAT-document, SAT-document, system CE-certification, risk analyses etc,
- In-House test
- Factory Acceptance Test
- Shipment, packaging, crates, insurance
- Installation and commissioning & start-up on-site
- A Site Acceptance Test
- Training: Measurement principles and hands-on opeation
- After sales service
- Service contracts

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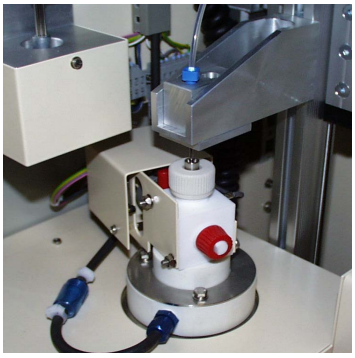
Online TC, TOC, TN, COD, TOD-analyser model Quickultra

Quick**ultra**-analysers in end test and almost ready for shipment



The injection needle positioned in the injection port of the reactor

Training at LAR Process Analysers AG Berlin

INNOVATIVE TECHNOLOGY IN WATER ANALYSIS FROM BERLIN
LAR
QuickTOC Ultra QT111107
Version 4.1.0 Mon Apr 23 16:51:20 CEST 2012
Please register your analysers at register@lar.com and receive free software updates
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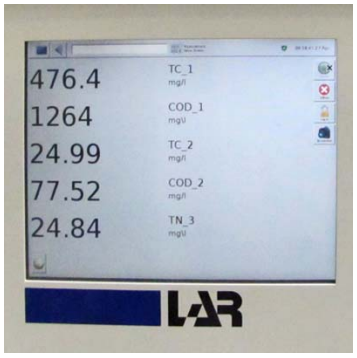
The Quick**ultra** is equipped with a 10.4 inch touch screen

ODS engineer check of the pH of a QuickTOC**ultra** analyser

Two sample vessels, two calibration vessels and one waste vessel

Flexibility, multi tasking and easy control via icon driven menus



Quick**ultra**, measurement of TC, COD and TN all in 3 minutes only

ODS project with a walk in shelter and a QuickTOC

Acid and demin water are safely stored in a reagent cabinet

Control of a skimmer via a 2-stream QuickTOC**ultra**

A QuickTOC in an ODS analyser shelter

True-TOC includes the measurement of particulate organic carbon

Oily waste water is pumped into a fast sample loop

Anti-isokinetic flow samplers separate big particles from the sample

ODS engineers installed another online TOC-analyser system

ODS
klöckner & co multi metal distribution

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Online TC, TOC, TN, COD, TOD-analyser model Quickultra

Online process TC, TOC, TN, COD, TOD analyser model Quickultra	
General specification	
Type	Model Quick**ultra**
Manufacturer	LAR Process Analysers AG, Germany, Berlin
Analytical Method	TC, TOC-direct, TOC-differential, COD-i by COD/TOC-correlation, TN, TOD / fast COD-o via thermal combustion of the sample at 1200ºC and the analyses of the formed carbon dioxide, nitric oxide or measurement of the oxygen depletion
Use	Stationary Online
Typical applications	Influent & effluent of a WWTP, storm water monitoring, cooling water, spill detection, load monitoring, process water monitoring and control etc.
Sample requirements • Pressure • Flow; no internal sample pump • Flow; with internal sample pump • Temperature, maximum • Size Organic Particles • Salt; as NaCl (gram/litre)	 • Atmospheric to a slight overpressure; 0,05 to 0,2 bar • 50 to 200 ml/min to internal sample overflow vessel • 30 ml/m; pre-pump time is selectable • 60ºC • Typical up to 1 mm (most particles are soft and spongy saturated with water) • Up to 15 gram/litre; Up to 60 gram/litre by use of high salt option
Sample conditioning: • Filtration • Fast sample loop • Anti-Isokinetic flow sampler	 • No, not needed • Yes, recommended velocity of sample flow >1 m/s • Yes, we recommend using the anti-isokinetic sampling technique to separate big particles with high mass (consult ODS BV for details)
Connections: • Sample • Carrier gas • Exhaust / carrier gas • Fluids to the drain header	 • 6/4 mm (OD/ID) / one per stream • 6/4 mm (OD/ID) / instrument air (nitrogen for COD-o/TOD) • 6/4 mm (OD/ID) • 10/8 mm (OD/ID) PVC tubes / to be connected into a drain header / slope down
Power; • Voltage / Frequency (V, Hz) • Power consumption	 • 230 / 50; (optional 110 / 60) • 950 $VA_{average}$ only during start-up, 600 VA typical
Rinse water	1 or 2 litre/week; depends on cycle time
Certificate	CE
Electrical cables	Via Glands; top of cabinet
Signals: • Analogue outputs • Relays / alarms	 • 4-20 mA; isolated, active, max 500 ohm; free programmable (1 per stream) • 4 each; contact closure; free programmable; fail safe
Materials; wetted parts (sample) • Inlet tube • Overflow vessel • Drain tube • Injection needle • Reactor • Sample pump (TOC)	 • Nylon • Quartz Glass • PVC • Stainless steel 316 • Ceramic • Marprene®
Mounting: • Basis • Rack / Frame • Hardware	 • Wall / solid, perfectly flat and horizontal, for example a concrete wall • Metal Frame, steel, coated, free standing (option: free standing LAR frame) • 4 expender bolts; M8 (part of the delivery)
Extra diagnostic sensors: • Thermal Mass Flow, carrier gas inlet • Thermal mass Flow; carrier gas outlet • Pressure sensor; reactor pressure and pressure pulse • Relative Humidity sensor; after condensate cooler	Measures status of: • Carrier gas consumption, differential inlet/outlet carrier gas • Leakage in the gas circuit; flowchecks sample injection via flow variations • Blocking of the reactor output or gas circuit; • Checks good operation of cooler, protects and bypasses gas sensors if needed
USB connection (download/upload)	• Program parameter settings • Data transfer of log-files • Screen shots • User level control
Service menu: • Service • Calibrate • Status; tests • Test run • Setting of alarm parameters • Observe measured values of sensors	 • Flush injection system or sample lines, Furnace on/off, Condensate pump on/off.. • Manually validation or calibration, daily automatic calibration • Relays, signal outputs, oven, cooler etc. • Check settings and fine-tune robot positions. • Pressure, delta P, carrier gas flow balancing and limits, R.H. limits etc. • Gas sensor signal, graphical curve, carrier gas inlet and outlet etc.

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General Specification, continued	
Display	10,4 inch TFT colour touch screen
Menu	Intuitive software design Configuration by use of pictograms Multi language: standard English, German (contact your local LAR representative). 3 user levels; accessible by passwords Input via soft keyboard and soft numeric keyboard Modes: Information, visualising tables and graphs and peaks, calibration & validation, measurement parameters, service issues, data logger, etc.
Data logging	Logger capacity for years of data Measuring values TC, TOC, TN, COD etc. Calibration data Log book of events Format: csv (text)
Warranty	1 year after delivery; wearing parts and consumables excluded
Documentation	• Manuals, drawings, spare part listing • User manual available in the English language; • Drawings, schematics included. • Technical training manuals on request
Maintenance and routine service: • Calibration • Cleaning of sample system • Inject-port • Outlet reactor • Pump tubes, condensate pump and sample pump • Scrubbers (aerosol / brass & zinc)	 • As needed e.g. 1x per month. This analyse is very stable! • 1x per month / clean applications: 1x per 2 month • 1x per month / o-ring replacement • Depends on salt content and injection volume; 1x per 6 month; 1x per month • 4x per year; replace • 4x per year; replace content (depends on sample composition)
Options	
Multi stream	Up to 6 sample stream; includes software upgrade, sample vessels, sample pumps, sample tubes. Sample and hold technique. Output values are frozen till they are re-freshed
Reactor High Salt version	Special reactor capable of handling brackish and salty waste water. Note: Salt is removed easily by shaking it out of the well accessible reactor foot
Languages: labels and soft keyboard • Standard • Special	 • English, German, Korean, Chinese (to be specified) • Any language and character set (to be specified)
RS232 and TCP/IP communication ports	• Communication via e.g. remote control
Additional equipment	
Analyser frame, rack	• Stable frame for the Quick**ultra** and reagent cabinet. Steel, coated.
Reagent cabinet	• For storage of 2 each 5 litre tanks e.g. demin water and a 1% w/w acid solution
Zero air supply: • Passive • active	 • Cartridges with activated carbon and soda lime. To be refilled every month. • Pressure Swing Absorption; maintenance once per 2 years. Outlet CO_2 <1 ppm
Nitrogen generator	• Pressure Swing Absorption; maintenance once per 2 years. Outlet O_2 <10 ppm
Sample delivery pump: • Submersible • Peristaltic	 • Type and model depends on application e.g. 400 VAC 3-phase; 1 1/2 “ • Type and model depends on application e.g. 1”, 230 VAC, speed control
Anti-isokinetic sampler • Material • Size • Arctic box	 • Several option e.g. PVC, PE or SS • Several option e.g. 1/2”, 1” • Insulated, reinforced fibreglass box. Space for 1 or 2 samplers

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Quickultra Analytical Methods & Gas Sensors	
Carbonaceous species	**TC, TOC-direct, TOC-differential (TRUE-TOC), TIC**
Analytical Method	Determination of the organic carbon content via thermal combustion of the sample at 1200ºC and the analyses of the resulting carbon dioxide
Conform	DIN EN 1484, ISO 8254 en EPA 415.1
Ranges	0 to 10 up to 0 to 50000 mg/l C (to be specified)
Repeatability	Typical <2% CV (of measured value, 25 to 100% of scale)
Reproducibility	Typical <1% CV
Drift	0 mg/l C per year; auto zero technique
Cycle time	TC: 3 minutes (programmable) TOC: 5,5 minutes (programmable)
Type of detector	NDIR infrared, no moving parts; maintenance free; digital data transfer; with integrated pressure and temperature compensation
Carrier gas requirements: • Quality • Consumption • Pressure	 • Dry and free of CO_2 ,particles and hydrocarbons • TC: Typical 30 Nl/h, TOC-direct: 45 Nl/h (multi stream add 8 Nl/h per sample stream 2 to 6) • 1,5 to 6 barg
Acid solution; strength and consumption	• TC; no acid needed. • TOC-direct; 1% w/w/ hydrochloric acid; 2 litres/week (or less when cycle time is longer) • TOC-differential; 1% w/w phosphoric acid; 2,5 litres/week (or less when cycle time is longer)
Outputs 4-20 mA / data logging	• TC-analyser: TC one output per stream • TOC-direct; TOC (NPOC); one output per stream • TOC-differential; TC, TOC and TIC; amount of outputs to be specified!
Nitrogen species	**TN**
Analytical Method	Determination of the total nitrogen content by thermal combustion at 1.200ºC and the analysis of the resulting NO-gas
Conform	DIN 38469 part 27, EN 12260, ISO-TR11905-2.
Ranges	50, 200, 1000 mg/l N (to be specified)
Repeatability	Typical <3% CV (of measured value, 25 to 100% of scale)
Reproducibility	Typical <2% CV
Drift	0 mg/l N per year; auto zero technique
Cycle time	3 minutes (programmable)
Type of detector	Electrochemical, solid state, to be exchanged once per 1 1/2 year
Carrier gas requirements: • Quality • Consumption • Pressure	 • Dry and free of particles and hydrocarbons • Typical 30 Nl/h • 1,5 to 6 barg
Reagents, acid	Not needed
Outputs 4-20 mA / data logging	TN; one output per stream
Oxygen demand methods	**COD-o / TOD**
Analytical Method	Determination of the oxygen demand via thermal combustion of the sample at 1200 degrees Celsius and the measurement of the amount of oxygen depletion in the oxygen enriched nitrogen carrier gas.
Conform	ASTM D6238 - 98(2011)
Ranges	500, 500, 2000, 8000, 15000, 30000 and 150000 mg/l -O_2 (to be specified)
Repeatability	Typical <3% CV (of measured value, 25 to 100% of scale)
Reproducibility	Typical <2% CV
Drift	< 10 mg/litre -O_2 per year due to auto zero technique
Cycle time	3 minutes (programmable)
Type of detector	O_2-sensor, zirconium oxide
Carrier gas requirements: • Quality • Consumption • Pressure	 • Nitrogen, high purity (grade 5.0 / 99,999 % N_2 / < 10 ppm O_2 and C_xH_y; required grade depends on TOD-analyser range) • Typically 20, maximum 28; 1 each cylinder (50 l / 200 bar) nitrogen per week. • 1,5 to 6 barg
Reagents	Not needed
Outputs 4-20 mA / data logging	TOD; one output per stream

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Quickultra Cabinet versions	**Standard cabinet**	**NEMA4X cabinet**	**ATEX Zone 2 Ex p cabinet**	**ATEX Zone 1 Ex p cabinet**
Quick **U**nlimited **L**ow Maintenance **T**rue TOC **R**eliable **A**ccurate				
Purpose	Standard industrial area e.g. an analyser shelter, building, factory	Industrial area with risk of corrosive vapours and gasses	Hazardous area with risk of explosive gasses or vapours according ATEX zone 2	Hazardous area with risk of explosive gasses or vapours according ATEX zone 1
IP classification	IP54	IP64	IP64	IP64
Hazardous area according	-	-	Ex II 3 G Ex pz II T3	Ex II 2 G Ex px II T3
Ambient air temperature • recommended • Minimum / maximum	 • 5 to 30ºC • 0 to 38ºC	 • 5 to 25ºC • 0 to 30ºC	 • 5 to 25ºC • 0 to 30ºC	 • 5 to 25ºC • 0 to 30ºC
Ambient air humidity	Max. 95% (non condensing)	Max. 95% (non condensing)	Max. 95% (non condensing)	Max. 95% (non condensing)
Cooling / heat transfer	by ambient air and a fan	Integrated advanced air-air heat exchanger	Integrated advanced air-air heat exchanger	Integrated advanced air-air heat exchanger
Material of the cabinet	Steel, coated grey, hinges/ right side, window Securit	Stainless Steel 316; brushed, coated / transparent hinges / right side, window Securit	Stainless Steel 316, brushed, coated / transparent hinges / right side, window Securit	Stainless Steel 316, brushed, coated / transparent hinges / right side, window Securit
Dimensions: (hxwxd) Excl. glands, connectors etc • 1-stream • 2-6 streams (incl. pumps)	 • 1060x595x530 mm • 1060x750x530 mm *Request for a detailed drawing*	(hxwxd) • 1060x815x570 mm • 1060x935x570 mm *Request for a detailed drawing*	(hxwxd) • 1060x912x570 mm • 1060x992x570 mm *Request for a detailed drawing*	(hxwxd) • 1060x915x570 mm • 1060x995x570 mm *Request for a detailed drawing*
Weight (1-stream)	105 kg	120 kg	120 kg	120 kg
OPTIONS				
High temperature version Ambient air 5 to 50ºC	-	via an integrated compressor cooler	-	-
Zero Air Supply • Passive by cartridges • Active by PSA	Passive or Active • Yes • Yes, recommended	 • Yes • Yes, recommended	 • Yes, recommended • Special via Ex d	 • Yes, recommended • Option: Special via Ex d

Hardware / analyser cabinet

The Quick**ultra** is built in a rugged steel/stainless steel cabinet. The analyser is suitable for wall, frame or strut mounting.

It has two separate compartments. Both compartments are easy accessible for maintenance.

The analyser compartment have the following features:
- Dry compartments for the electrical distribution units, power supplies, electronics, e.g. I/O-nodes, gas sensors and the panel computer with big touch screen display;
- Wet compartment for the XY-robot, sample vessels, sample stirrers, injection system, electrical oven with reactor tube, peristaltic pump, peltier cooler etc.

Due to modifications or improvements specifications are subject to change by manufacturer or ODS without notice *revision: 2012-07*

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